IN THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Currently Amended) A method for controlling a registration overlay in semiconductor processing, comprising:

        a) estimating a state using moving horizon estimation; and

        b) determining an input of the registration overlay using the state; and

        c) applying the input.

2. (Original) A method for controlling a registration overlay as recited in Claim 1, wherein estimating the state is subject to a state constraint.

3. (Original) A method for controlling a registration overlay as recited in Claim 1, wherein the input determined is an optimal input.

4. (Original) A method for controlling a registration overlay as recited in Claim 1, wherein determining the input is subject to an input constraint.

5. (Cancelled) A method for controlling a registration overlay as recited in Claim 1, further comprising applying the input.

6. (Original) A method for controlling a registration overlay as recited in Claim 1, wherein estimating the state is subject to a multi-dimensional constraint.

7. (Original) A method for controlling a registration overlay as recited in Claim 1, wherein determining the input of the registration overlay using the state comprises evaluating an objective function.

8. (Original) A method for controlling a registration overlay as recited in Claim 7, wherein the objective function is defined by a user.

9. (Original) A method for controlling a registration overlay as recited in Claim 7, wherein the objective function includes a deviation from a target.

10. (Original) A method for controlling a registration overlay as recited in Claim 7, wherein the objective function includes a rate of change of inputs.

11. (Original) A method for controlling a registration overlay as recited in Claim 1, wherein determining the input of the registration overlay using the state comprises evaluating an

objective function and determining an optimal solution of the objective function subject to an input constraint.

12. (Original) A method for controlling a registration overlay as recited in Claim 1, wherein estimating the state using a moving horizon estimation comprises evaluating an estimator objective function, subject to a state constraint.

13. (Original) A method for controlling a registration overlay as recited in Claim 1, wherein estimating the state using a moving horizon estimation comprises taking an output measurement and evaluating an estimator objective function based on the output measurement.

14. (Original) A method for controlling a registration overlay as recited in Claim 1, wherein estimating the state using a moving horizon estimation comprises optimizing an estimator objective function.

15. (Original) A method for controlling a registration overlay as recited in Claim 1, wherein estimating the state using a moving horizon estimation comprises optimizing an estimator objective function using a quadratic programming technique.

16. (Original) A method for controlling a registration overlay as recited in Claim 1, wherein estimating the state using a moving horizon estimation comprises optimizing an estimator objective function using a nonlinear programming technique.

17. (Original) A method for controlling a registration overlay as recited in Claim 1, wherein determining the input of the registration overlay using the state comprises evaluating a regulator objective function.

18. (Original) A method for controlling a registration overlay as recited in Claim 1, wherein determining the input of the registration overlay using the state comprises optimizing a regulator objective function.

19. (Original) A method for controlling a registration overlay as recited in Claim 1, wherein determining the input of the registration overlay using the state comprises optimizing a regulator objective function using a quadratic programming technique.

20. (Original) A method for controlling a registration overlay as recited in Claim 1, wherein determining the input of the registration overlay using the state comprises optimizing a regulator objective function using a least-mean squared fit technique.

21. (Original) A method for controlling a registration overlay as recited in Claim 1, wherein determining the input of the registration overlay using the state comprises optimizing a regulator objective function using a nonlinear programming technique.

22. (Original) A method for controlling a registration overlay as recited in Claim 1, wherein determining the input of the registration overlay using the state comprises optimizing a regulator objective function using a least-mean squared fit technique.

23. (Original) A method for controlling a registration overlay as recited in Claim 1, further comprising repeating a) - b) until a desired input is obtained.

24. (Original) A method for controlling a registration overlay as recited in Claim 1, further comprising removing a steady-state offset by using a state disturbance model.

25. (Original) A method for controlling a registration overlay as recited in Claim 1, further comprising removing a steady-state offset by using a disturbance model that integrates a disturbance.

26. (Original) A method for controlling a registration overlay as recited in Claim 25, wherein the disturbance comprises an input disturbance.

27. (Original) A method for controlling a registration overlay as recited in Claim 25, wherein the disturbance comprises a state disturbance.

28. (Original) A method for controlling a registration overlay as recited in Claim 25, wherein the disturbance comprises an output disturbance.

29. (Currently amended) A computer program product for controlling a registration overlay in semiconductor processing, the computer program product being embodied in a computer readable medium and comprising computer instructions for:

   a) estimating a state using moving horizon estimation; and

   b) determining an input of the registration overlay using the state; and

   c) applying the input.

30. (Currently amended) A system for controlling a registration overlay, comprising:

   an estimator configured to determine a state using moving horizon estimation; and

   a regulator configured to determine an input of the registration overlay using the state and to apply the input.